(1)

INSTRUCTION MANUAL

REGULATED POWER SUPPLIES

MODELS

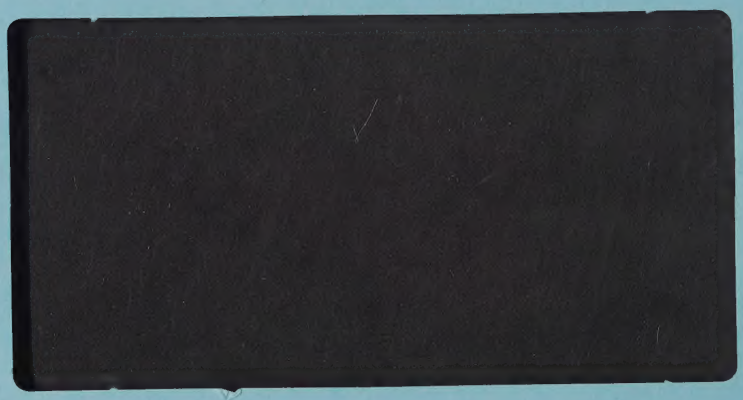
LXD-D-152, LXD-D-152R

LXT-D-5152, LXT-D-5152R

LXT-D-5152R-A, LXT-D-5152R-B

LAMBDA

LAMBDA ELECTRONICS MELVILLE, L. I., N. Y.



INSTRUCTION MANUAL

FOR

REGULATED POWER SUPPLIES

MODELS

LXD-D-152, LXD-D-152R

LXT-D-5152, LXT-D-5152R

LXT-D-5152R-A, LXT-D-5152R-B

his manual provides instructions intended for the operation of Lambda
ower supplies and is not to be reproduced without the written con-
ent of Lambda Electronics. All information contained herein applies
o all LXD-D and LXT-D models unless otherwise specified.

AMBDA ELECTRONICS MELVILLE, L.I., N.Y.

MAIN PLANT TELEPHONE: 516 MYrtle 4-4200

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SPECIFICATIONS AND FEATURES

D.C. OUTPUT - Voltage regulated for line and load. Negative output always tracks positive output. See table I for voltage and current ratings.

TABLE I

VOLTAGE AND CURRENT RANGES

MODELS	VOLTAGE RANGE (VDC)	* MAXIMUM CURRENT (AMPS) AT AMBIENT TEMPERATURE			
		40°C	50°C	60°C	71°C
LXD-D-152 LXD-D-152R	±15 ±12	6.2	5.6	4.9	4.0
		4.5	4.1	3.7	3.0
LXT-D-5152	5±5%	12.0	11.5	11.0	9.5
LXT-D-5152R LXT-D-5152R-A LXT-D-5152R-B	±15 ±12	3.1	2.7	2.2	1.7
		2.3	2.0	1.7	1.3

*For current ratings at different output voltages refer to page 3.

Current range must be chosen to suit the appropriate maximum ambient temperature.

EGULATED VOLTAGE OUTPUT (each output)

Regulation (line).....0.1% with input variations from 105-132 or 132-105 volts AC.

Regulation (load).....0.1% for load variations from no load to full load or full load to no load.

Ripple and Noise.....1.5 millivolts rms; 5 millivolts peak to peak.

Temperature Coefficient.....Output change in voltage 0.03%/°C.

Remote Sensing.....Provision is made for remote sensing to eliminate effect of power output lead resistance on DC regulation. No remote sensing is available for the common terminal of the dual output.

VERSHOOT - No overshoot under conditions of power turn-on, turn off, or power failure.

.C. INPUT - 105-132 VAC at 47-440 Hz. Ratings apply for 57-63 Hz. For operation at 47-53 Hz, delete the 40°C current rating. For operation at 63-440 Hz, consult factory.

TRACKING (Dual Output Only) - Absolute voltage difference between negative and positive outputs within 2%; 0.2% change for all conditions of line, load and temperature.

OVERLOAD PROTECTION

Thermal.....Thermal circuit resets automatically when over temperature condition is eliminated.

Electrical
External.....Automatic electronic current limiting circuit limits output current to a safe value Automatic current limiting protects the load and power supply when external overloads and direct shorts occur.

Internal
(LXT-D-5152R-B
only).....Fuse F1, provides protection against internal circuit failure.

OVERVOLTAGE PROTECTION - Single output of LXT-D-5152R-B includes a fixed overvoltage protection circuit which prevents damage to the load caused be excessive power supply output voltage. Overvoltage protection firing range is between 6.4 and 6.8 volts D.C.

INPUT AND OUTPUT CONNECTIONS - Terminal block(s) on rear of chassis.

OPERATING AMBIENT TEMPERATURE RANGE AND DUTY CYCLE - Continuous duty from 0°C to 71°C ambient.

STORAGE TEMPERATURE (non-operating) - -55°C to 85°C

OUTPUT ADJUST CONTROL - Voltage adjust control permits adjustment of D.C. output(s). Single control simultaneously adjusts the dual ($\pm$15 to $\pm$12V) outputs. A separate control is provided for the single, 5V output of LXT-D.

PHYSICAL DATA

Size.....4-15/16" x 7-1/2" x 9-3/8"

Weight.....23 lbs. net; 26 lbs. shipping wt.

Finish.....Gray, FED. STD. 595 No. 26081

MOUNTING - Three surfaces, each with tapped mounting holes can be utilized for mounting this unit. All LXD-D and LXT-D power supplies can be mounted with Top, Front, or Left Side facing up. Top, Front, or Left Side must be in a horizontal plane. Refer to figure 15 for mounting details.

SUFFIX "R" - LXD-D and LXT-D power supplies with suffix "R" are fungus inert.

"V" OPTION - LXD-D and LXT-D power supplies can be obtained for 205-265 VAC, 47-440Hz input or 187-242 VAC, 47-440Hz input. See nameplate for AC input rating. See schematic diagram for rewiring of AC input. Ratings apply for 57-63Hz. For operation at 47-53Hz, delete the 40°C current rating. For operation at 63-440Hz, consult factory.

ACCESSORIES

Rack Adapters.....Rack adapters, LRA-6, LRA-10, LRA-11, and LRA-13 used for ruggedized mounting with or without chassis slides are available.

Overvoltage Protector..Externally mounted, Overvoltage Protector L-20-OV-30 is available for the ±15V output. Externally mounted, Overvoltage Protector L-20-OV-5 is available for the 5V output of LXT-D-5152R-A.

Metered and Non-Metered panels.....Metered panel MP-50-LXD-D-152R and Non-Metered panel P-50-LXD-D-152R are available for use with Lambda rack adapters LRA-6 and LRA-7.

DETERMINATION OF CURRENT RATINGS AT OUTPUT VOLTAGE BETWEEN ±12 & ±15 VOLTS - Current ratings vary linearly with output voltages. To determine current for any given output voltage (between rated limits) proceed as follows:

1. Determine operating ambient temperature
2. Find constants (see formula) m and c in chart below.
3. Applying current formula:

$$Io = mVo + c$$

where Io = output current, m = constant (see chart), c = constant (see chart) and Vo = desired output voltage; determine output current.

Constant m,c at Ambient Temperature

MODELS	40°C		50°C		60°C		71°C	
	m	c	m	c	m	c	m	c
LXD-D	0.57	-2.35	0.50	-1.90	0.40	-1.10	0.33	-1.00
LXT-D	0.27	-0.95	0.23	-0.75	0.17	-0.35	0.13	-0.25

THEROY OF OPERATION

The theroy applies to the plus (+) side of the dual output, but is equally applicable to the minus (-) side and to the single output of the triple model.

The Lambda power supply consists of an AC input circuit and transformer; and a main regulator circuit consisting of the main rectifier, filter, series regulator transistors, *and Hybrid Voltage Regulator. The Hybrid Voltage Regulator (HC1 for LXD, HC2 for LXT) utilizes thick film resistors, capacitors, monolithic integrated circuits and power driver transistors in chip form to achieve maximum reliablitity. The circuit arrangement is shown in block diagram form, figure 13 for LXD, 14 for LXT.

Single phase input power is applied to transformer T1 through terminals 1 and 2.

The main rectifier, a ful wave rectifier, provides the power which is filtered by capacitor C1 (LXD) or C19 (LXT) and then regulated via series regulators Q8 and Q9. *

Voltage tracking of the slave section to the master section is accomplished as follows:

When the master output voltage increases, voltage across R12 and R15 also increases, causing an increase in one input to a comparator located in (HC2 for LXD, HC3 for LXT). The comparator compares this change with the output voltage of the slave unit resulting in an error signal at the output of the comparator. The error signal from the comparator causes the series regulator impedance to decrease, this action increases the slave output voltage.

*The LXT dual output has no series regulator transistors. The series regulator is contained within the Hybrid Voltage Regulator.

OV CIRCUIT, FUNCTIONAL DESCRIPTION (LXT-D-5152R-B ONLY)

When the power supply output voltage increase above the overvoltage limit (6.4 to 6.8 volts), HC4 fires causing the power supply output voltage to drop.

OPERATING INSTRUCTIONS

BASIC MODE OF OPERATION

This power supply operates as a constant voltage source provided the load current does not exceed the rated value at 40°C. For continuous operation, load current must not exceed the rating for each ambient temperature. When load exceeds the 40°C rating, both voltage and current decrease until voltage reaches zero and the current at short circuit is reduced to a value which is less that the rated current.

CONNECTIONS FOR OPERATION

NOTE: Make all connections to the unit before applying AC input power.

Ground Connections. The Lambda power supply can be operated either with negative, positive, or common terminal grounded. Use insulated wire whenever any output terminal of dual output is connected to terminal 3 of LXD or terminal 9 of LXT.

Connection Terminals. Make all connections to the supply at the terminal block on rear of the supply. Apply input power to terminals 1 and 2; always connect the ungrounded (hot) lead to terminal 1.

LXD....The supply positive terminal is brought out to terminal 7. The supply negative terminal is borught out to terminal 5. Recommended wiring of the power supply to the load and selection of wiring is shown in figures 1,2,6 and 8.

LXT....The dual output positive terminal is brought out to terminal 13. The dual output negative terminal is brought out to terminal 11. The single output positive terminal is brought out to terminal 6. The single output negative terminal is brought out to terminal 4. Recommended wiring of the power supply to the load and selection of wiring is shown in figures 1,2,5, and 7.

Selection of proper wiring is made on the basis of load requirements. Make all performance checks and measurements of current and voltage at the rear output terminals. Connect measuring devices directly to terminals or use the shortest leads possible.

SUPPLY LOAD CONNECTIONS

Connections For Operation as a Constant Voltage Source. The output impedance and regulation of the power supply at the load may change when using the supply as a constant voltage source and connecting leads of practical length are used. To minimize the effect of the output leads on these characteristics, remote sensing is used. Recommended types of supply-load connections with local or remote sensing are described in the following paragraphs.

Refer to figure 1 to determine voltage drop for particular cable length, wire size and current conditions. Lead lengths must be measured from supply terminals to load terminals as shown in figure 2.

Local Sensing Connection, Figures 5 & 6. Local sensing is the connection suitable for applications with relatively constant load. Any load connection combination, as shown in the figures, can be used.

Remote Sensing Connection, Figures 7 & 8. Remote sensing provides complete compensation for the DC voltage drops in the connecting cables. Sensing leads should be a twisted pair to minimize AC pick-up. A 2.5 mf, elect., capacitor may be required between output terminals and sense terminals to reduce moise pick-up.

Programmed Voltage Connections, Using External Resistor, Figure 9. (LXT single output only). Discrete voltage steps can be programmed with a resistance voltage divider valued at a mominal 1000 ohms/volt change and a shorting-type switch as shown in figure 9. When continous voltage variations are required, use a variable resistor with the same 1000 ohms/volt ratio in place of the resistive voltage divider and shorting-type switch. Use a low temperature coefficient resistor to assure most stable operation.

Before programming, adjust programming resistor for zero resistance and set voltage adjust control to the minimum rated output voltage. Output voltage of programmed supply will mominally be minimum output voltage plus 1 volt per 1000 ohms.

As shown in figure 9, voltages can be programmed utilizing either local or remote snesing connections, as desired.

Programmed Voltage Connections Using Programming Voltage, Figure 10. (LXT single output only). The power supply voltage output can be programmed with an externally connected programming power supply The output voltage change of the programmed supply will maintain a one-to-one ratio with the voltage of the programming supply. If the output voltage control of the programmed supply is set to minimum output voltage, output voltage of programmed supply will be minimum output voltage plus voltage of programming supply.

The programming supply must have a reverse current capability of 1.1 ma. minimum.

Alternatively, when supplies with less than 1.1 ma. reverse current capability are used, a resistor capable of drawing 1.1 ma. at the minimum programming voltage must be connected across the output terminals of the supply. This programming supply must be rated to handle all excess resistor current at the maximum programming voltage.

OPERATION AFTER PROTECTIVE DEVICE SHUTDOWN

Thermal Shutdown

The thermostat opens the input circuit only when the temperature of the transistor heat radiator exceeds a maximum safe value. The thermostat will automatically reset when the temperature of the heat sink decreases to a safe operating value. After eliminating the cause(s) for overheating and allowing time for the power supply to cool to a proper temperature, resume operation of the supply.

Overvoltage Shutdown (Single output of LXT-D-5152R-B only)

When the power supply output voltage increases above the overvoltage limit, HC4 will short circuit output of the supply. After eliminating the cause(s) for overvoltage, resume operation of the supply by momentarily interrupting the AC input circuit. (refer to Trouble Shooting Chart)

Fuse Shutdown (Single output of LXT-D-5152R-B only)

Fuses will blow when the maximum rated current value for the fuse is exceeded. Fatigue failure of fuses can occur when mechanical vibrations from the installation combine with thermally induced stresses to weaken the fuse metal. Many fuse failures are caused by a temporary condition and replacing the blown fuse will make the fuse protected circuit operative. If a malfunction occurs in the power supply causing an overvoltage condition, F1 will blow and prevent excessive current from damaging the load and power supply. If an overvoltage condition arises due to operator error or inadequate output connection, F1 will not blow.

MAINTAINANCE

GENERAL

This section describes trouble analysis routine and replacement procedures that are useful for servicing the Lambda LXD-D & LXT-D power supplies. A trouble chart is provided as an aid for the troubleshooter. Refer to the section on SPECIFICATIONS AND FEATURES for the minimum performance standards.

TROUBLE ANALYSIS

Whenever trouble occurs, systematically check primary power lines, external circuit elements, and external wiring for malfunction before trouble shooting equipment. Failures and malfunctions often can be traced to simple causes such as improper jumper and supply-load connections.

Use the electrical schematic diagram and block diagram, figures 13 & 14, as an aid to locating trouble causes. The schematic diagram contains various circuit voltages that are averages for normal operation. Measure these voltages using the conditions for measurement specified on the schematic diagram. Use measuring probes carefully to avoid causing short circuits and damaging circuit components.

CHECKING TRANSISTORS AND CAPACITORS

Check transistors with an instrument that has a highly limited current capability. Observe proper polarity to avoid error in measurement. The forward transistor resistance is low but never zero; backward resistance is always higher than the forward resistance.

For good transistors, the forward resistance for any junction is <u>always</u> greater than zero.

Do not assume trouble is eliminated when only one part is replaced. This is especially true when one transistor fails, causing other transistors to fail. Replacing only one transistor and turning power on before checking for additional defective components could damage the replaced component.

When soldering semi-conductor devices, wherever possible, hold the lead being soldered with a pair of pliers placed between the component and the solder joint to provide an effective heat sink.

<u>NOTE</u>: The leakage resistance obtained from a simple resistance check of a capacitor is not always an indication of a faulty capacitor. In all cases the capacitors are shunted with resistances, some of which have low values. Only a dead short is a true indication of a shorted capacitor.

TROUBLE CHART

The trouble chart is intended as a guide for locating trouble causes, and is used along with the schematic diagram.

The operating conditions assumed for the trouble chart are as follows:

a) AC power of proper voltage and frequency is present at input terminals.

b) Common terminal is connected to chassis ground and positive or negative terminal of single output of LXT-D-5152 is connected to chassis ground.

c) The power supply is connected for constant voltage with local sensing. See schematic; dotted lines indicate jumpers connected for local sensing operation.

TROUBLE SHOOTING CHART

Sympton	Probable Cause	Remedy
1. Zero volts DC output, both sides of dual output and single output.	Open T1 primary	Check T1 primary for open, replace as necessary.
	Open thermostat, S1.	Refer to table I of SPECIFICATIONS AND FEATURES for current ratings at given ambient temperature. After allowing time for the power supply to cool, resume operation of power supply.
2. Zero volts DC output, both sides of dual output and/or single output.	Short circuit across output of supply.	Check load & load connections, correct as necessary.
3. Zero volts DC output, both sides of dual output.	Shorted C1, CR3, C4 (LXD); C19, CR3, C18 (LXT).	Check and replace as necssary.

TROUBLE SHOOTING CHART

Symptom	Probable Cause	Remedy
	Series regulator section open. (LXD only)	Check HC1 pin 8 for correct voltage reading (as indicated on schematic diagram), replace as necessary.
	Current sensing resistor open. (LXD only)	Check R25, R26 for open, replace as necessary.
	Series regulator section open. (LXT only)	Check HC2 pins 1-7 for open, replace as necessar
4. Zero volts DC output, minus side.	Shorted C16 (LXD only), CR12, C18 (LXD), C21 (LXT), C9, R15.	Check and replace as necessary.
	Series regulator section open. (LXD only)	Check HC2 pin 8 for correct voltage reading (as indicated on schematic diagram), replace as necessary.
	Current sensing resistor open. (LXD only)	Check R28, R29 for open, replace as necessary.
	Series regulator section open. (LXT only)	Check HC3 pins 1-7 for open, replace as necessary.
5. Zero volts DC output, single output.	C1, C4 shorted.	Check and replace as necessary.
	R5 open.	Check R5 for open, replace as necessary.
	Series regulator section open.	Check HC1 pin 10 for correct voltage reading (as indicated on schematic diagram).
	Current sensing resistor open.	Check R25, R27 for open, replace as necessary.

TROUBLE SHOOTING CHART

Symptom	Probable Cause	Remedy
	Auxiliary rectifier CR4 open.	Check CR4 for open, replace as necessary.
. Unable to adjust output voltage.	Damaged VDC adjust Control.	Check R3 (dual output) or R1 (single output) for short or open, replace as necessary.
	R2 and/or R4 set too low. (LXD and single output of LXT only)	Refer to ADJUSTMENT OF CALIBRATION CONTROLS.
. High ripple at line frequency or twice line frequency and unregulated DC output, both sides of dual output.	Series regulator section shorted. (LXD only)	Check Q8 and Q9 for short, replace as necessary.
	Shorted HC2.(LXT only)	Check HC2 pins 1-7 for short.
	Open plus sense lead.	Check sensing connections.
. Same as 7, minus side of dual output.	Series regulator section shorted. (LXT only)	Check Q10, Q11 for short; replace as necessary.
	Shorted HC3 (LXT only)	Check HC3 pins 1-7 for short.
	Open minus sense jumper.	Check connection, correct as necessary.
. Same as 7, single output.	Series regulator section shorted.	Check Q8-Q10 for short, replace as necessary.
	C3 open.	Check C3 for open; replace as necessary.
	Open plus and/or minus sense jumper.	Check connection, correct as necessary.

TROUBLE SHOOTING CHART

	Symptom	Probable Cause	Remedy
10.	Same as 7, except intermittent.	Foreign matter fallen into unit.	Check for loose bench hardware and wire clippings that may have fallen through cover.
11.	High ripple at twice line frequency, both sides of dual output.	Open C1 (LXD). Open C19 (LXT).	Check and replace as necessary.
12.	Same as 11, minus side.	Open C19 (LXD). Open C20 (LXT).	Check and replace as necessary.
13.	Same as 11, single output.	Open C1.	Check and replace as necessary.
14.	High ripple at line frequency, both sides or dual output.	Open CR1 or CR2 (LXD); CR10 or CR11 (LXT).	Check for open, replace as required.
15.	Same as 14, minus side.	Open CR10 or CR11 (LXD); CR13 or CR14 (LXT).	Check for open, replace as required.
16.	Same as 14, single output.	Open CR1 or CR2	Check for open, replace as required.
17.	High ripple at other than line frequency.	Defective C4, C18 (LXD); C4, C18, C21 (LXT).	Check C4, C18, C21; replace as necessary
18.	Large spikes at output.	Defective rectifiers CR1, CR2, CR10, CR11, (LXD); CR1, CR2, CR10 CR11, CR13, CR14, (LXT).	Replace as required.
19.	Output voltage too high, both sides of dual output and/or single output.	R3 (dual output) or R1 (single output) set too high; open sensing lead.	Check setting of R3 (dual output) or R1 (single output); check output connections.

TROUBLE SHOOTING CHART

	Symptom	Probable Cause	Remedy
20.	Very low output voltage (single output of LXT-D-5152R-B or any output where an overvoltage protector is used).	Overvoltage protector fired due to OV condition.	Momentarily interrupt AC input. If supply operates normally, a transient has occurred. in line or load, check wiring (switches, etc.). If supply fails to reach full output voltage, remove AC input, disconnect overvoltage protector from TB1 +V term., remove load, apply AC power and refer to procedure for: Output Voltage Too High "Symptom 19."

ERFORMANCE CHECKS

Check the ripple and regulation of the power supply using the est connection diagram shown in figures 11 & 12. Use suggested est equipment or equivalent to obtain accurate results. Refer to PECIFICATIONS AND FEATURES for minmum performance standards.

Set the differential meter, DC VTVM (John Fluke Model 801H or quivalent) to the selected power supply operating voltage. Check he power supply load regulation accuracy while switching from the oad to no-load condition. Long load leads should be a twisted pair o minimize AC pickup.

Use a Variac to vary the line voltage from 105-132 or 132-105 olts AC and check the power supply line regulation accuracy on the TVM differential meter.

Perform checks on both plus and minus sides of dual output and he single output of LXT-D.

ADJUSTMENT OF CALIBRATION CONTROLS R2 and R4 (LXD and single output of LXT only)

Whenever Q8-Q11, HC1, HC2, R25-R28, R2 or R4 are replaced, and voltage and current indications do not reflect maximum ratings, adjust R2 and R4 as follows. The adjustment procedure requires that the power supply is removed from associated equipment, is at an ambient temperature of 25-30°C, and is stabilized and not operating.

1. Remove AC input power to the supply.
2. Break seal on wiper of R2 from resistor housing and turn to full CW position.
3. Operate power supply for constant voltage with local sensing, connected as shown in figure 5 for single output, figure 6 for dual output of LXD, with no external load.
4. Turn voltage adjust control until minimum rated output voltage is obtained.
5. Apply load so that output current is 115% of 40°C rating for the unit. (On LXD unit, apply load to plus (+) output only.)
6. Using an oscilliscope, Tektronix 503 or equivalent, observe output voltage, plus (+) side only on LXD, while adjusting R2 in CCW direction. Adjust R2 until output ripple increases sharply and oscilloscope pattern changes.
7. After adjustment is completed, remove AC power input to the supply and use glyptol sealant to seal wiper of R2 to resistor housing.
8. After sealing, check setting and repeat adjustment procedure if required.

The following steps apply to the minus (-) side of LXD only.

9. Remove AC input power to the supply.
10. Break seal on wiper of R4 from resistor housing and turn to full CW position.
11. Operate power supply for constant voltage with local sensing, connected as shown in figure 6, with no external load.
12. Turn voltage adjust control unitl minimum rated output voltage is obtained.
13. Apply load so that output current is 115% of 40°C rating for the unit.
14. Using an oscilloscope, Tektronix 503 or equivalent, observe output voltage while adjusting R4 in CCW direction. Adjust R4 until output ripple increases sharply and oscilloscope pattern changes.
15. after adjustment is completed, remove AC power input to the supply and use glyptol sealant to seal wiper of R4 to resistor housing.
16. After sealing, check setting and repeat adjustment procedure if required.

SERVICE

When additional instructions are required or repair service is lesired, contact the nearest Lambda office where trained personnel ınd complete facilities are ready to assist you.

Please include the power supply model and serial number together ʻith complete details of the problem. On receipt of this information ambda will supply service data or advise shipping for factory repair ervice.

All repairs not covered by the warranty will be billed at cost nd an estimate forwarded for approval before work is started.

PARTS ORDERING

Standard components and special components used in the Lambda ower supply can be obtained from the factory. In case of emergency, ritical spare parts are available through any Lambda office.

The following information must be included when ordering parts:

1. Model number and serial number of power supply and purchase date.

2. Lambda part number.

3. Description of part together with circuit designation.

4. If part is not an electronic part, or is not listed, provide a description, function, and location, of the part.

PARTS LIST

The electrical parts located on Lambda models LXD-D-152, LXD-D-152R, LXT-D-5152R-A, and LXT-D-5152R-B are listed here. In addition, there are separate listings of parts for the "V" option and LMOV-3 accessory.

MODELS LXD-D-152, LXD-D-152R

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
C1	Cap., elect., 22,000 mf -10+100%, 40 vdc	CBT-22-021
C2, C3	Not assigned	
C4	Cap., elect., 900 mf -10+100%, 35 vdc	CBR-90-040
C5	Cap., mylar, 0.15 mf ±10%, 200 vdc	CGM-15-005
C6, C7	Not assigned	
C8	Cap., mylar, 0.033 mf ±10%, 400 vdc	CGL-33-009
C9	Cap., elect., 3.3 mf ±20%, 35 vdc	CBN-33-019
C10 thru C12	Not assigned	
C13	Cap., mylar, 0.01 mf ±10%, 200 vdc	CGL-10-002
C14	Not assigned	
C15, C16	Same as C5	
C17	Same as C13	
C18	Same as C4	
C19	Same as C1	
CR1 thru CR3	Rectifier	FBL-00-054
CR4	Rectifier	FBL-00-092
CR5 thru CR9	Not assigned	
CR10 thru CR12	Same as CR1	
CR13	Same as CR4	
HC1	Hybrid regulator	FBH-24-019
HC2	Hybrid regulator	FBH-24-020
Q1 thru Q7	Not assigned	
Q8 thru Q11	Transistor, NPN	FBN-36485
R1	Res., var., ww, 9,000 ohms ±5%, 2 w	DNS-90-058
R2	Res., var., ww, 1,200 ohms ±10%, 2 w	DNS-12-087
R3	Not assigned	
R4	Same as R2	
R5	Res., comp., 8,200 ohms ±10%, 1 w	DGB-8221
R6	Not assigned	
R7	Same as R5	
R8	Res., comp., 1,000 ohms ±10%, ½ w	DEB-1021
R9 thru R11	Not assigned	
R12	Res., film, 8,870 ohms ±0.5%, 1/8 w	DCS-89-090
R13, R14	Not assigned	

MODELS LXD-D-152, LXD-D-152R (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
R15	Res., film, 2,550 ohms ±0.5%, 1/8 w	DCS-25-089
R16, R17	Not assigned	
R18	Res., comp., 2,200 ohms ±10%, ¼ w	DCB-2221
R19	Res., comp., 100 ohms ±10%, ½ w	DEB-1011
R20 thru R22	Not assigned	
R23	Same as R19	
R24	Not assigned	
R25 thru R30	Res., ww, 0.22 ohm ±5%, 5 w	DFM-22-045
S1	Thermostat	FKA-155-020
T1	Transformer	ABA-LXD-D152

MODELS LXT-D-5152R-A, LXT-D-5152R-B

C1	Cap., elect., 60,000 mf -10+100%, 15 vdc	CBT-60-036
C2	Not assigned	
C3	Cap., elect., 40 mf -7.5+87.5%, 35 vdc	CBP-40-014
C4	Cap., elect., 1,700 mf -10+100%, 20 vdc	CBS-17-035
C5	Cap., mylar, 0.15 mf ±10%, 200 vdc	CGM-15-005
C6, C7	Not assigned	
C8	Cap., mylar, 0.033 mf ±10%, 400 vdc	CGL-33-009
C9	Cap., elect., 3.3 mf ±20%, 35 vdc	CBN-33-019
C10	Cap., mylar, 470 pf ±10%, 200 vdc	CGJ-47-002
C11, C12	Not assigned	
C13	Cap., mylar, 0.01 mf ±10%, 200 vdc	CGL-10-002
C14	Not assigned	
C15, C16	Cap., mylar, 0.1 mf ±10%, 200 vdc	CAM-10-012
C17	Not assigned	
C18	Cap., elect., 400 mf -10+100%, 40 vdc	CBR-40-085
C19, C20	Cap., elect., 5,100 mf -10+100%, 30 vdc	CBS-51-088
C21	Same as C18	
C22, C23	Same as C15	
C24	Same as C5	
CR1, CR2	Rectifier	FBL-00-054
CR3	Rectifier	FBL-00-094
CR4	Rectifier	FBL-00-030
CR5 thru CR9	Not assigned	
CR10, CR11	Same as CR1	

MODELS LXT-D-5152R-A, LXT-D-5152R-B (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
R12	Same as CR3	
R13, R14	Same as CR1	
R15, R16	Same as CR4	
R17	Rectifier	FBL-00-092
1*	Fuse, 20A, 3AB, NORM-BLO	FFJ-20-000
IC1	Hybrid regulator	FBH-24-009
IC2	Hybrid regulator	FBH-24-021
IC3	Hybrid regulator	FBH-24-022
IC4*	Hybrid circuit	L-12-OV-5
1	Not assigned	
ru		
7		
8	Transistor, NPN	FBN-36485
ru		
10		
1	Res., var., ww, 1,000 ohms ±5%, 5 w	DNS-10-055
2	Res., var., ww, 1,200 ohms ±10%, 2 w	DNS-12-087
3	Res., var., ww, 9,000 ohms ±5%, 2 w	DNS-90-058
4	Not assigned	
5	Res., comp., 620 ohms ±5%, ½ w	DEB-6215
6	Not assigned	
7	Res., comp., 2,200 ohms ±10%, ½ w	DEB-2221
8	Res., comp., 1,000 ohms ±10%, ½ w	DEB-1021
9	Not assigned	
ru		
11		
12	Res., film, 8,870 ohms ±0.5%, 1/8 w	DCS-89-090
13, 14	Not assigned	
15	Res., film, 2,550 ohms ±0.5%, 1/8 w	DCS-25-089
16, 17	Not assigned	
18	Res., comp., 2,200 ohms ±10%, ¼ w	DCB-2221
19	Not assigned	
ru		
22		
23	Res., comp., 68 ohms ±10%, ½ w	DEB-6801
24	Res., ww, 1,200 ohms ±2%, 3 w	DFS-12-016
25	Res., ww, 0.1 ohm ±5%, 5 w	DFM-10-074
ru		
27		
	Thermostat	FKA-137-014
	Transformer	ABA-LXT-D5152
F1*	Fuseholder	HRM-00-009

F1, HC4, and XF1 only used on Model LXT-D-5152R-B.

PARTS FOR "V" OPTION

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
	On models LXD-D-152, LXD-D-152R, LXT-D-5152R-A, and LXT-D-5152R-B, with suffix "V", capacitor C8 and transformer T1 change. Part no. changes for C8 and T1 are listed here.	
	ALL MODELS	
C8	Cap., paper, 0.01 mf ±10%, 1,000 vdc	CAL-10-021
	MODEL LXD-D-152, LXD-D-152R	
T1	Transformer	ABA-LXDD-152G
	MODELS LXT-D-5152R-A, LXT-D-5152R-B	
T1	Transformer	ABA-LXTD-515G

PARTS FOR METERED AND NON-METERED PANEL ACCESSORIES MODELS MP-50-LXD-D-152R, P-50-LXD-D-152R

C1, C2	Cap., tant., 2.5 mf -15 +75%, 100 vdc	CBN-25-010
DS1	Pilot light assembly	HRD-00-007
F1	Fuse, 10A, 3AB, SLO-BLO	FFG-10-000
M1*	Voltmeter, 0-40 vdc	EBP-40-013
M2*	Ammeter, 0-10 adc	EDP-10-013
S1	Switch, SPST	FDA-11-040
XF1	Fuseholder	HRK-00-007

* This part only used on MP-50-LXD-D-152R.

PARTS FOR METERED AND NON-METERED PANEL ACCESSORIES WITH "V" OPTION

On all metered and non-metered panels with suffix "V", fuse F1 changes and a resistor is added in series with pilot light DS1. Part nos. for F1 and DS1 Res. are listed here.

F1	Fuse, 5A, 3AB, SLO-BLO	FFG-05-000
DS1-Res.	Res., comp., 120,000 ohms ±10%, ½ w	DEB-1241

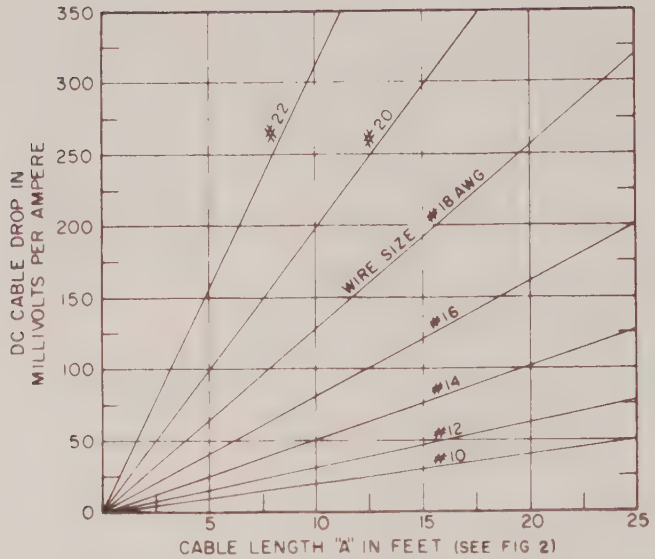


Figure 1. Cable Connection Chart

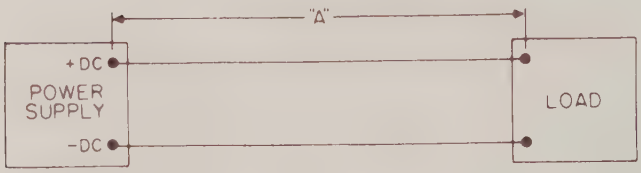


Figure 2. Cable Length "A" in Feet

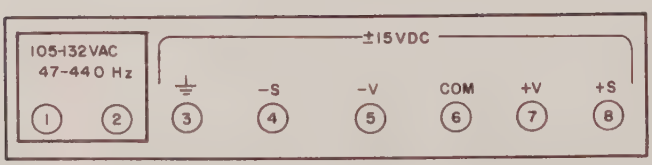


Figure 3. LXD Terminal Block Configuration

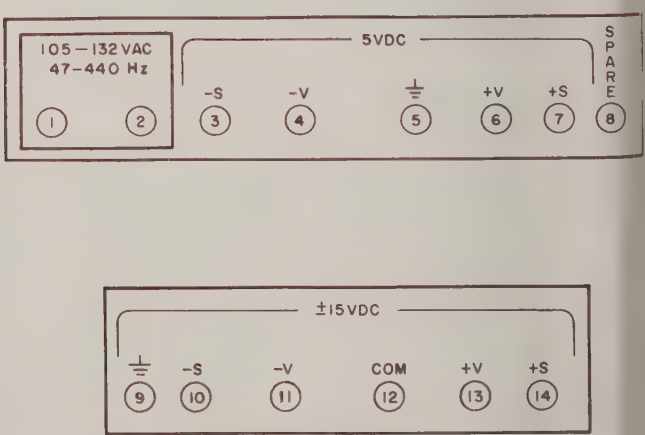
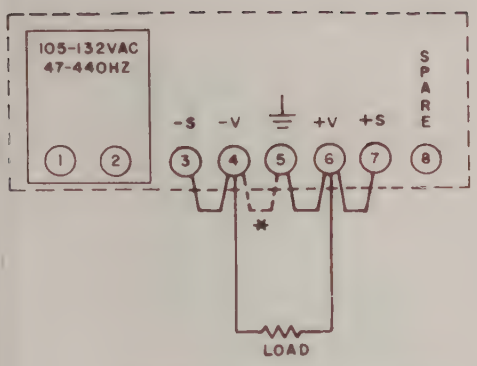
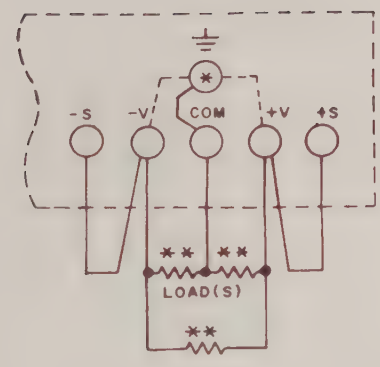


Figure 4. LXT Terminal Block Configuration



* FOR NEGATIVE GROUND DISCONNECT JUMPER FROM TERMINALS (⏚) AND (+V) AND RECONNECT TO TERMINALS (-V) AND (⏚)

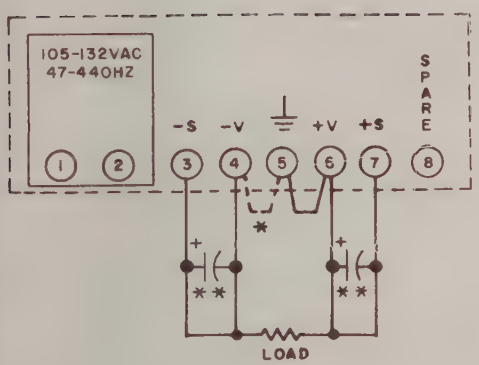
Figure 5. Single Output Local Sensing Connection (LXT Only)



* -V, COM, OR +V TERMINAL MAY BE GROUNDED, USE TERM. 3 ON LXD OR TERM. 9 ON LXT AS (⏚)

** LOAD(S) CAN BE CONNECTED IN ANY CONFIGURATION.

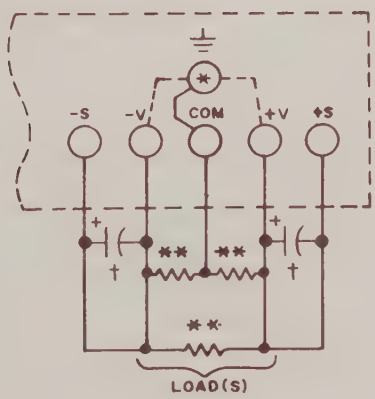
Figure 6. Dual Output Local Sensing Connection



* FOR NEGATIVE GROUND DISCONNECT JUMPER FROM TERMINALS (⏚) AND (+V) AND RECONNECT TO TERMINALS (-V) AND (⏚)

** USE 2.5MF CAPACITOR RATED AT TWICE THE OUTPUT VOLTAGE.

Figure 7. Single Output Remote Sensing Connection (LXT Only)

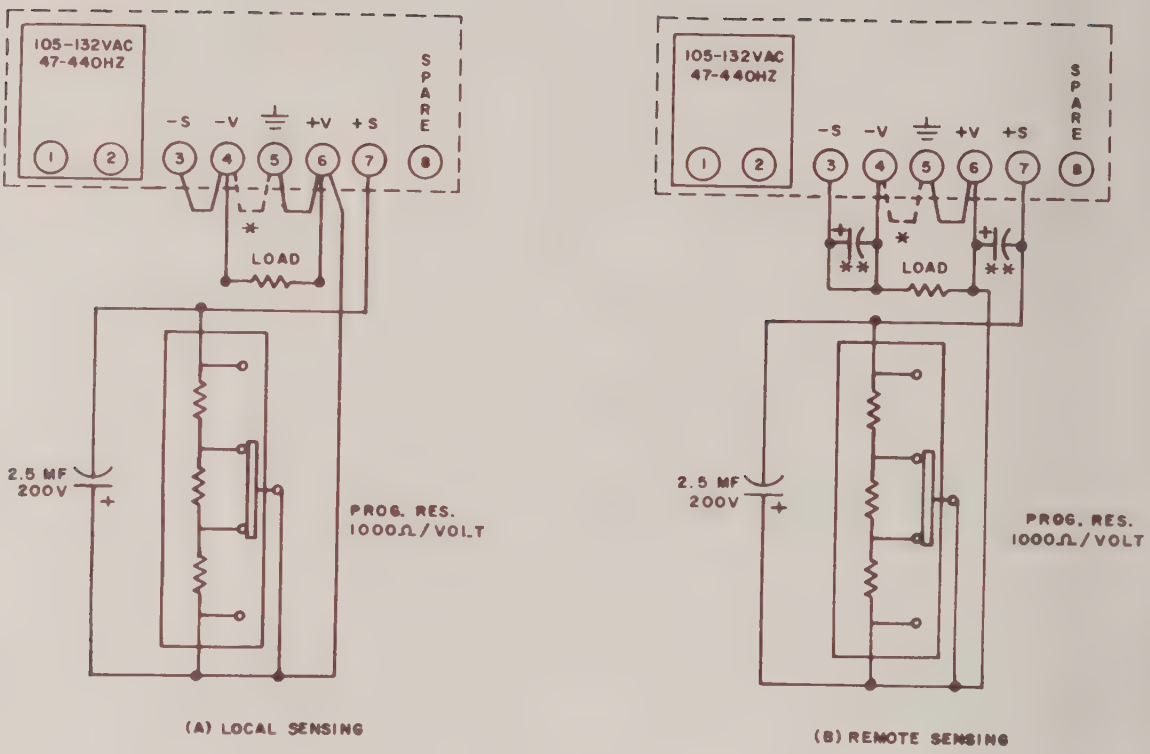


* -V, COM, OR +V TERMINAL MAY BE GROUNDED, USE TERM. 3 ON LXD OR TERM. 9 ON LXT AS (⏚)

** LOAD(S) CAN BE CONNECTED IN ANY CONFIGURATION.

† USE 2.5 MF CAPACITOR RATED AT TWICE THE OUTPUT VOLTAGE.

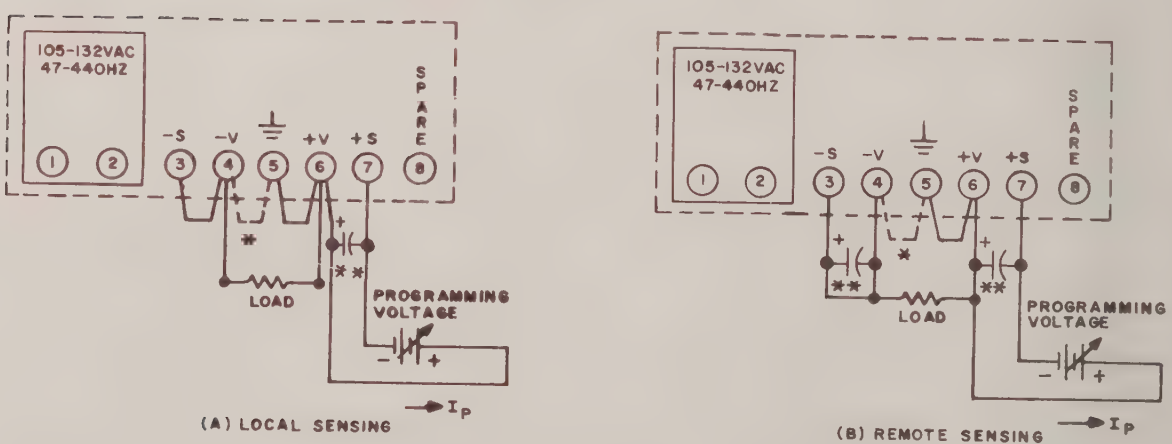
Figure 8. Dual Output Remote Sensing Connection



* FOR NEGATIVE GROUND, DISCONNECT JUMPER FROM TERMINALS (⏚) AND (+V) AND RECONNECT TO TERMINALS (-V) AND (⏚)

** USE 2.5MF CAPACITOR RATED AT TWICE THE OUTPUT VOLTAGE.

Figure 9. Programmed Voltage, With External Resistor
(Single Output Of LXT Only)



* FOR NEGATIVE GROUND, DISCONNECT JUMPER FROM TERMINALS (⏚) AND (+V) AND RECONNECT TO TERMINALS (-V) AND (⏚)

** USE 2.5MF CAPACITOR RATED AT TWICE THE OUTPUT VOLTAGE.

Figure 10. Programmed Voltage, With External Programmed Voltage Source
(Single Output Of LXT Only)

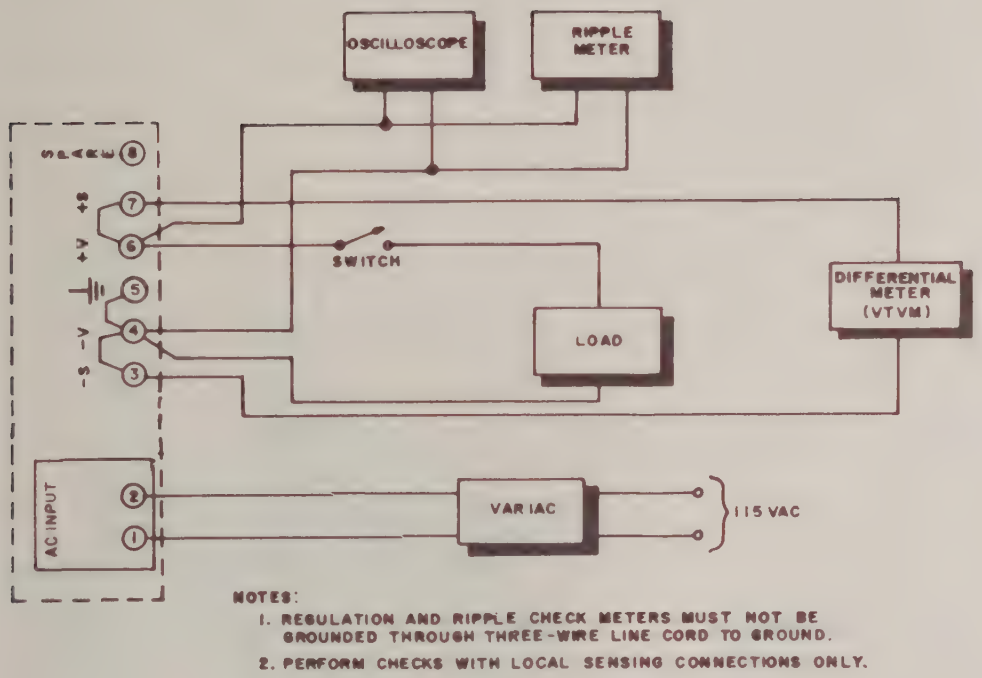


Figure 11. Test Connections For Constant Voltage Performance Checks,
(Single Output Of LXT Only)

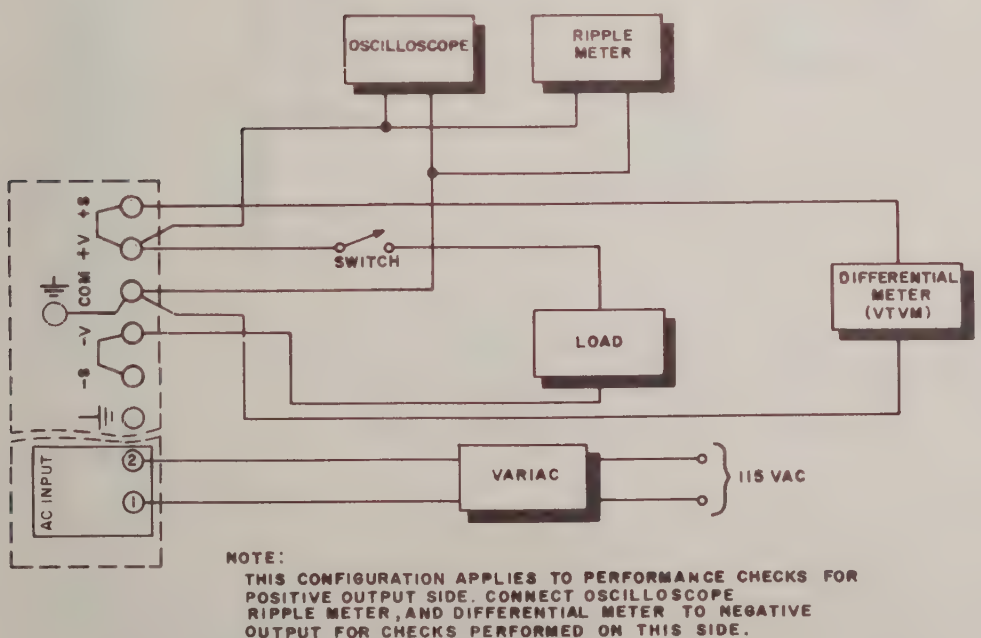


Figure 12. Test Connections For Constant Voltage Performance Checks,
(Dual Output Only)

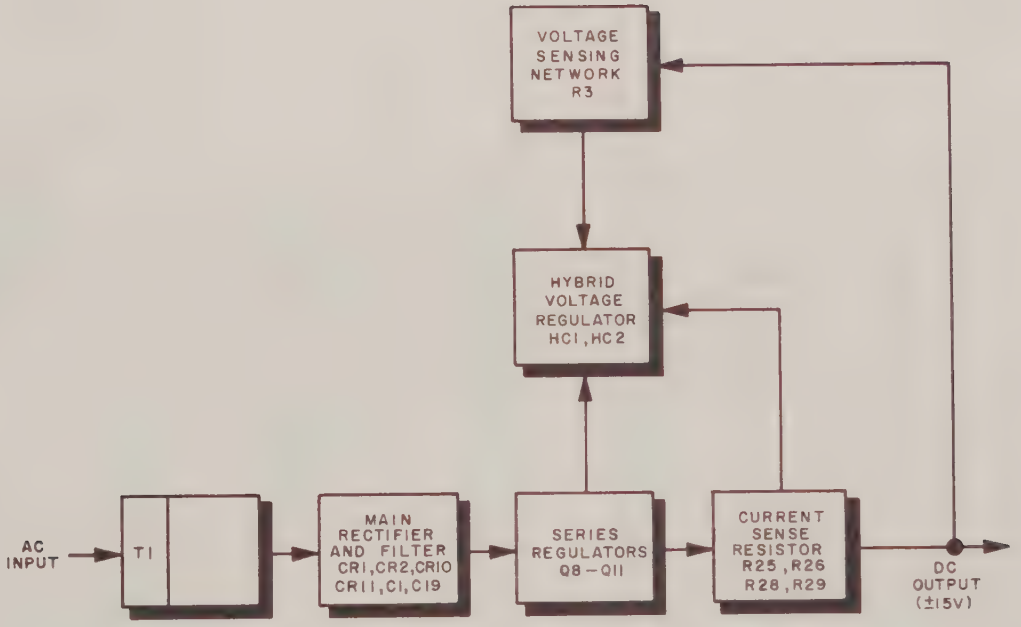

VOLTAGE SENSING NETWORK R3
HYBRID VOLTAGE REGULATOR HC1, HC2
AC INPUT
T1
MAIN RECTIFIER AND FILTER CR1, CR2, CR10 CR11, C1, C19
SERIES REGULATORS Q8 – Q11
CURRENT SENSE RESISTOR R25, R26 R28, R29
DC OUTPUT (±15V)

Figure 13. Typical Block Diagram (LXD Only)

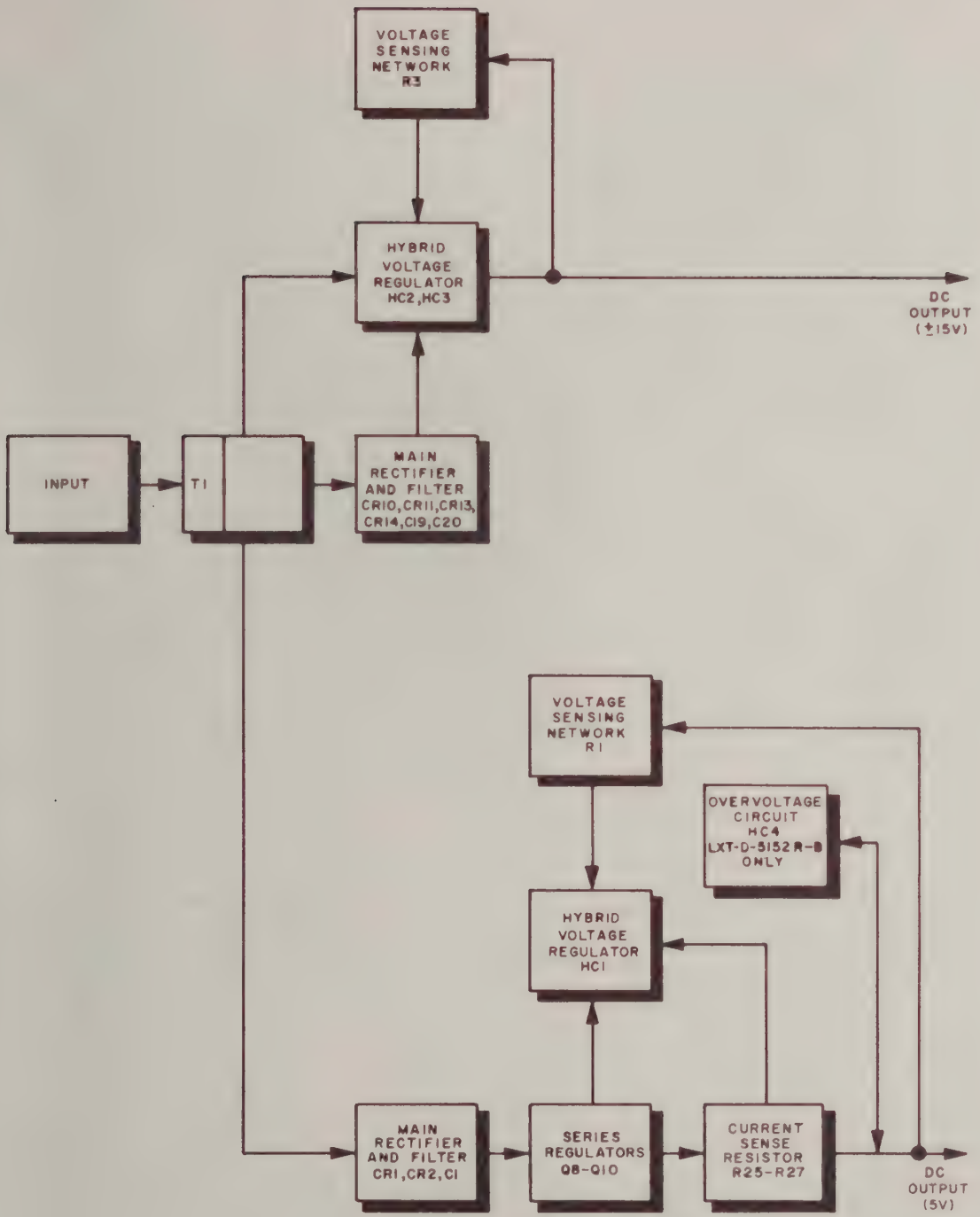
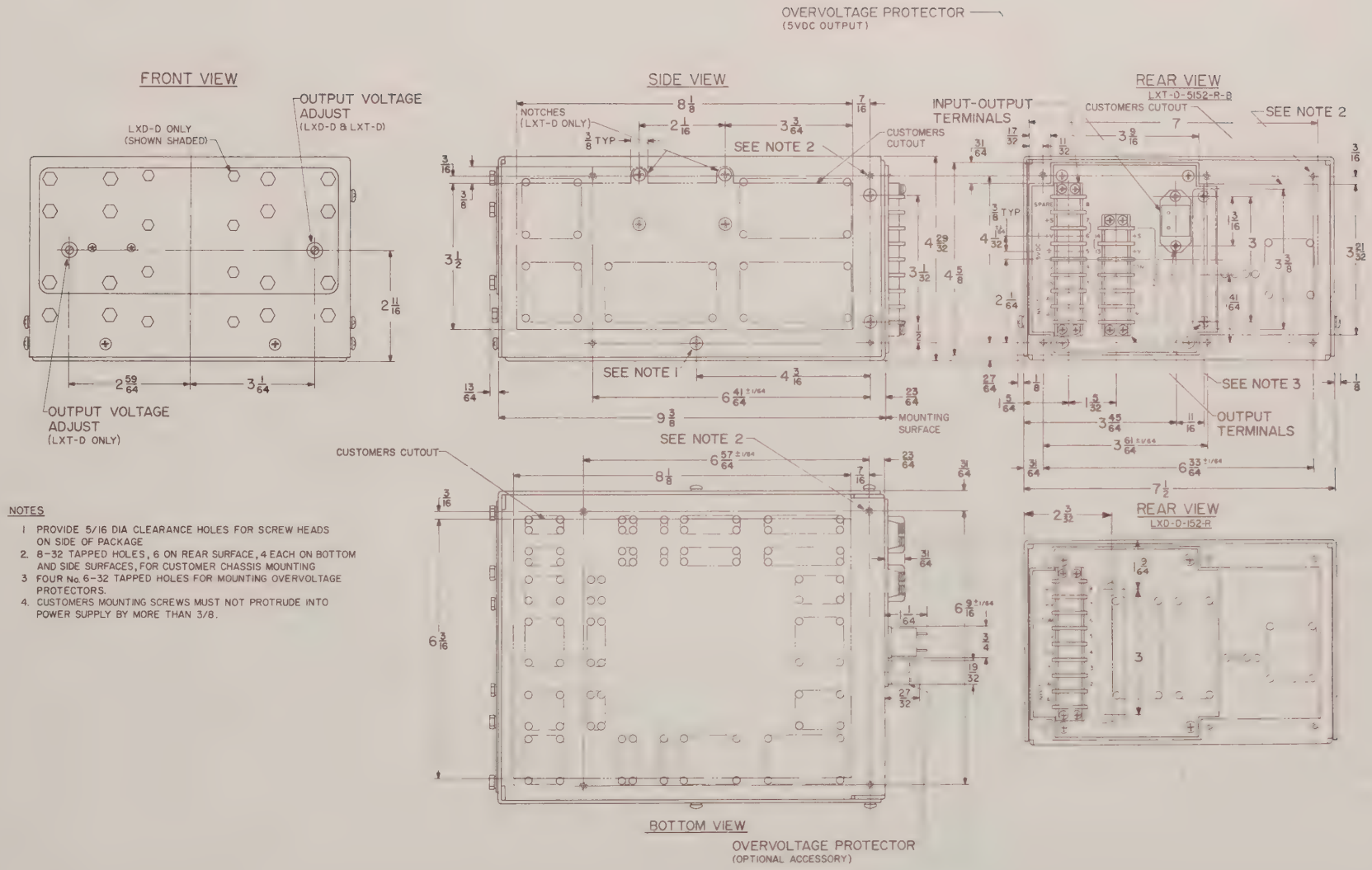

VOLTAGE SENSING NETWORK R3
HYBRID VOLTAGE REGULATOR HC2, HC3
DC OUTPUT (±15V)
INPUT
T1
MAIN RECTIFIER AND FILTER CR10, CR11, CR13, CR14, C19, C20
VOLTAGE SENSING NETWORK R1
OVERVOLTAGE CIRCUIT HC4 LXT-D-5152 R-B ONLY
HYBRID VOLTAGE REGULATOR HC1
MAIN RECTIFIER AND FILTER CR1, CR2, C1
SERIES REGULATORS Q8-Q10
CURRENT SENSE RESISTOR R25-R27
DC OUTPUT (5V)

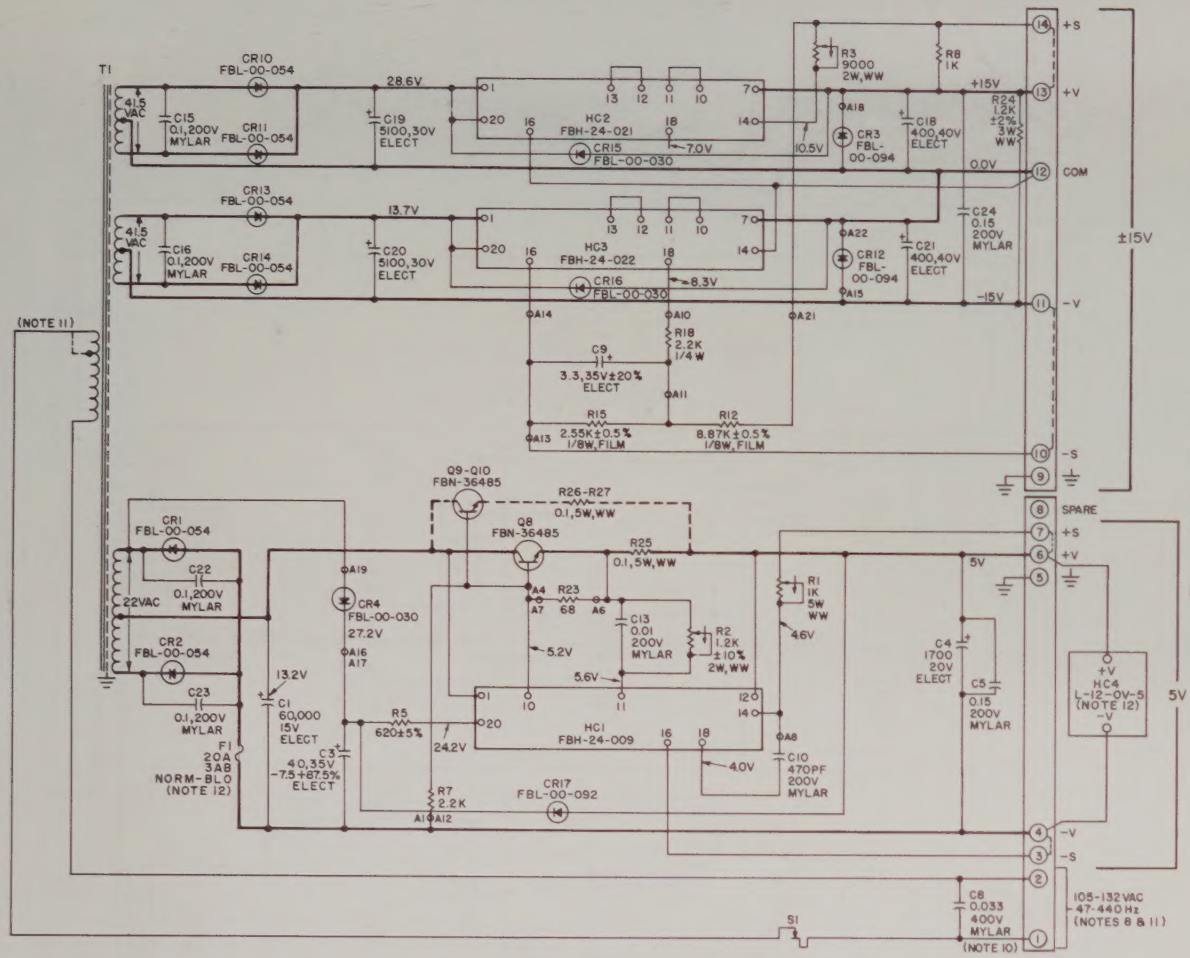
Figure 14. Typical Block Diagram (LXT Only)



NOTES

1. PROVIDE 5/16 DIA CLEARANCE HOLES FOR SCREW HEADS ON SIDE OF PACKAGE
2. 8-32 TAPPED HOLES, 6 ON REAR SURFACE, 4 EACH ON BOTTOM AND SIDE SURFACES, FOR CUSTOMER CHASSIS MOUNTING
3. FOUR No. 6-32 TAPPED HOLES FOR MOUNTING OVERVOLTAGE PROTECTORS.
4. CUSTOMERS MOUNTING SCREWS MUST NOT PROTRUDE INTO POWER SUPPLY BY MORE THAN 3/8.

Figure 15. Outline Drawing



NOTES:

1. RESISTORS ARE COMP. 1/2W WITH VALUES IN OHMS, UNLESS OTHERWISE NOTED.
2. RESISTOR TOLERANCES: COMP. ±10%, FILM ±1%, WIREWOUND ±5%, UNLESS OTHERWISE NOTED.
3. CAPACITOR VALUES ARE IN MICROFARADS.
4. CAPACITOR TOLERANCES: MYLAR ±10%, ELECTROLYTIC -10 +100%.
5. DESIGNATIONS ARE LAMBDA PART NUMBERS.
6. SYMBOLS:
   - ↑ INDICATES CLOCKWISE ROTATION OF SHAFT.
   - ⏚ INDICATES CONNECTION TO CHASSIS.
   - -o- INDICATES TERM. ON TERM. BOARD.
   - ▭ INDICATES ACTUAL UNIT MARKING.
7. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS: INPUT: 115 VAC, 60Hz. RATED VOLTAGE NO LOAD. INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE D.C. UNLESS OTHERWISE NOTED, D.C. MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER BETWEEN COM (TERM. 12) FOR ±15V OUTPUT, -V (TERM. 4) FOR 5V OUTPUT; AND INDICATED POINTS UNLESS OTHERWISE NOTED.
8. FOR 47-53 Hz INPUT, DELETE 40°C CURRENT RATING. FOR 63-440Hz INPUT, CONSULT FACTORY.
9. COAT MOUNTING SURFACE OF Q8 THRU Q10, HC2, & HC3 WITH DOW CORNING NO. 340 SILICONE GREASE.
10. C8 IS 0.01 MF ±10%, 1000V, PAPER ON UNITS WITH "V" OPTION.
11. ON UNITS WITH "V" OPTION, T1 HAS TAPPED PRIMARY. "V" OPTION UNITS CAN BE WIRED FOR 187-242V INPUT (USING TAP) OR FOR 205-265V INPUT (USING ENTIRE PRIMARY).
12. F1 AND HC4 ONLY USED ON MODEL LXT-D-5152R-B.

THIS SCHEMATIC APPLIES TO UNITS BEARING SERIAL NO. PREFIX A

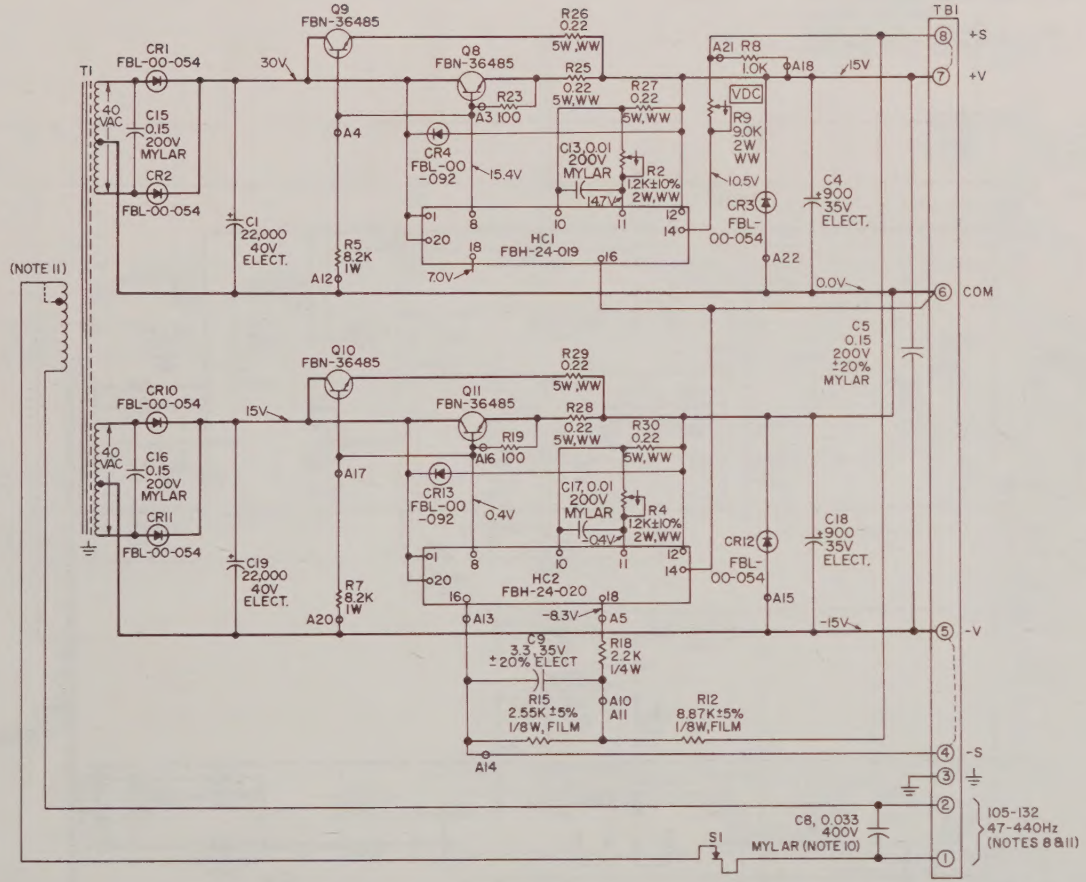
FOR WIRING OF POWER SUPPLY TO LOAD REFER TO SUPPLY-TO-LOAD WIRING DIAGRAMS.
DOTTED CONNECTIONS SHOWN ON TB1 INDICATE JUMPERS IN PLACE FOR LOCAL SENSING CONNECTION.

SCHEMATIC DIAGRAM

REGULATED POWER SUPPLY

MODEL
LXT-D-5152R-A
LXT-D-5152R-B

LAMBDA
ELECTRONICS
MELVILLE, NEW YORK
DIVISION OF Veeco INSTRUMENTS INC.



FOR WIRING OF POWER SUPPLY TO LOAD REFER TO SUPPLY-TO-LOAD WIRING DIAGRAMS.
DOTTED CONNECTIONS SHOWN ON TB1 INDICATE JUMPERS IN PLACE FOR LOCAL SENSING CONNECTION.

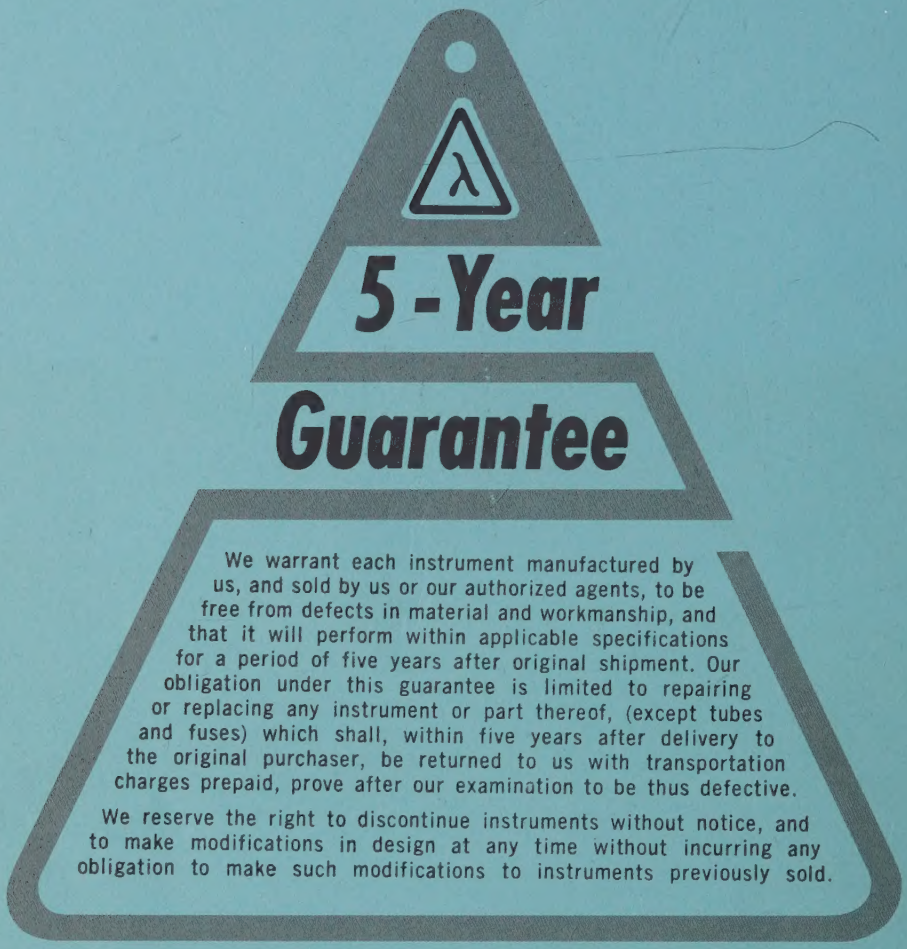
NOTES:
1. RESISTORS ARE COMP. 1/2W WITH VALUES IN OHMS, UNLESS OTHERWISE NOTED.
2. RESISTOR TOLERANCES: COMP. ±10%, FILM ±1%, WIREWOUND ±5%, UNLESS OTHERWISE NOTED.
3. CAPACITOR VALUES ARE IN MICROFARADS.
4. CAPACITOR TOLERANCES: MYLAR ±10%, ELECTROLYTIC -10 +100%.
5. DESIGNATIONS ARE LAMBDA PART NUMBERS.
6. SYMBOLS:
   - INDICATES CLOCKWISE ROTATION OF SHAFT.
   - INDICATES CONNECTION TO CHASSIS.
   - INDICATES TERM. ON PRINTED CIRCUIT BOARD.
   - INDICATES ACTUAL UNIT MARKING.
7. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS: INPUT: 115 VAC, 60Hz. RATED VOLTAGE NO LOAD. INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE D.C. UNLESS OTHERWISE NOTED, D.C. MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER BETWEEN COM.(TERM. 6) & INDICATED POINTS UNLESS OTHERWISE NOTED.
8. FOR 47-53 Hz INPUT, DELETE 40°C CURRENT RATING. FOR 63-440 Hz INPUT, CONSULT FACTORY
9. COAT MOUNTING SURFACE OF Q8 THRU Q11, HC1 & HC2 WITH DOW CORNING NO. 340 SILICONE GREASE.
10. C8 IS 0.01 MF±10%, 1000V, PAPER ON UNITS WITH "V" OPTION.
11. ON UNITS WITH "V" OPTION, T1 HAS TAPPED PRIMARY. "V" OPTION UNITS CAN BE WIRED FOR 187-242 V INPUT (USING TAP) OR FOR 205-265 V INPUT (USING ENTIRE PRIMARY).

THIS SCHEMATIC APPLIES TO UNITS BEARING SERIAL NO. PREFIX A

SCHEMATIC DIAGRAM
REGULATED POWER SUPPLY

MODEL
LXD-D-152
LXD-D-152R

LAMBDA
ELECTRONICS
MELVILLE, NEW YORK
DIVISION OF Veeco INSTRUMENTS INC.


5 - Year
Guarantee
We warrant each instrument manufactured by us, and sold by us or our authorized agents, to be free from defects in material and workmanship, and that it will perform within applicable specifications for a period of five years after original shipment. Our obligation under this guarantee is limited to repairing or replacing any instrument or part thereof, (except tubes and fuses) which shall, within five years after delivery to the original purchaser, be returned to us with transportation charges prepaid, prove after our examination to be thus defective.
We reserve the right to discontinue instruments without notice, and to make modifications in design at any time without incurring any obligation to make such modifications to instruments previously sold.

LAMBDA ELECTRONICS
515 BROAD HOLLOW ROAD • MELVILLE, L. I., NEW YORK • 516 MYRTLE 4-4200

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